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# Physical activity levels, sedentary behaviors, and physical fitness of female adolescents with and without intellectual disabilities attending school in Kinshasa

Teddy Bofosa[1] A-G, Paulo Bunga[2] A,E-G, Guy Bumoko[3] A,C,D,G, Augustin Buhendwa[1] A,C,D,E-G, Eric Kam[1] C,D,G, Constant Nkiama[1] A,D,G, Betty Miangindula[1] A-G

[1] University of Kinshasa, Faculty of Medicine, University Clinics of Kinshasa, Department of Physical Medicine and Rehabilitation, Kinshasa, Democratic Republic of Congo
[2] University of Kinshasa, Faculty of Medicine, University Clinics of Kinshasa, Department of Pediatrics, Kinshasa, Democratic Republic of Congo
[3] University of Kinshasa, Faculty of Medicine, Neuro-Psychopathological Center, Neurology Department, Kinshasa, Democratic Republic of Congo

Original article

## Abstract

The aim of this study was to compare physical activity (PA), sedentary behavior, and physical fitness (PF) levels in female adolescents with and without intellectual disability (ID). An analytical cross-sectional study was conducted in Kinshasa, Democratic Republic of Congo, with 247 female adolescents with 123 with ID and 124 without ID, over a three-month period from 1st November 2022, to 28th February 2023. PF parameters such as balance, flexibility, and arm strength from the EUROFIT battery were assessed in both groups. These were complemented by the assessment of PA and sedentary behavior in the school setting using the CAPAS-Q 8–18 year questionnaire. Female Adolescents with ID had significantly lower PF scores in the balance, flexibility and arm strength components compared to their peers without ID ($p < 0.001$). They also exhibited higher body fat mass and lower muscle mass ($p < 0.001$). At school, they spend fewer hours in physical activity, less time walking or running, do not sweat, feel less stuffy while walking, and climb fewer flights of stairs compared to their peers without intellectual disability ($p < 0.001$). Furthermore, they spend more time sitting and in front of screens per day ($p < 0.001$). A significant association was observed between body composition parameters and physical activity ($p < 0.001$). Female adolescents with ID have higher fat mass and reduced lean mass. They also have lower levels of PA and increased sedentary behavior. Finally, an association between body composition parameters and PF was observed.

## Keywords

- physical activity
- intellectual disability
- sedentary lifestyle
- female adolescents

## Contribution

A – Preparation of the research project
B – Assembly of data
C – Conducting of statistical analysis
D – Interpretation of results
E – Manuscript preparation
F – Literature review
G – Revising the manuscript

## Corresponding author

**Tedy Bofasa**
e-mail: bofosa.linkoko@unikin.ac.cd

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### Conflict of interest

None declared.

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This research did not receive any grants from public, commercial or non-profit organizations.

## Ethical approval

The National Health Ethics Committee of the Ministry of Public Health of the Democratic Republic of Congo gave a favorable opinion for the conduct of this study under no. 404/CNES/BN/PMMF/2022 of 30/10/2022. The data were collected anonymously and kept confidential according to the Declaration of Helsinki. A written informed consent form was signed by all participants, their parents or legal guardians after receiving a detailed description of the study procedures.

University of Kinshasa
Faculty of Medicine
University Clinics of Kinshasa
Department of Physical Medicine and Rehabilitation
Kinshasa, Democratic Republic of Congo

# Introduction

Adolescence is a crucial period in human development, marked by organic and physiological maturation, development of physical abilities, and stabilization of motor skills, all of which can have a lasting impact on health in adulthood.[1] Physical activity (PA) and reduction of sedentary behavior (SB) are key determinants of overall health, influencing body composition (BC), cardiorespiratory fitness, and mental well-being. Conversely, prolonged SB is significantly linked to a range of health risks, including excess body fat, reduced physical fitness (PF), and an increased risk of non-communicable diseases.[2] However, to minimize these risks, several forms of physical activity are proposed, including physical activities of daily life, in particular active travel, compulsory physical education and sports (PES) at school, recreation and active games, supervised physical activities and sports in clubs or associations or leisure centers, or practiced independently, alone, with family or with friends.[3]

Despite these guidelines, in many African countries the level of physical activity among adolescents remains a concern.[4]

The Democratic Republic of Congo (DRC), like many low- and middle-income countries, faces a double burden of malnutrition: persistent undernutrition and a rise of overweight/obesity among adolescents. A study conducted in Lubumbashi, DRC, by Kalenga[5] revealed significant overweight and obesity rates among school-aged adolescents, with prevalences of approximately 8% and 1%, respectively, of these key indicators of changes in young people's body composition. Despite these findings, there is a lack of national or provincial research in the DRC on physical activity levels, health status, body composition, and physical activity, as well as the links between body composition and physical activity in adolescent girls in general, and even less so among adolescent girls with intellectual disabilities.

In the international literature on adolescents with intellectual disability (ID), Sato et al.[6] found, after conducting a national study in Japan, that adolescents with ID exhibit significantly lower performance on all components of physical activity (PA) tests compared to their peers without ID, as well as reduced levels of physical activity (PA). Similarly, systematic reviews highlight that adolescents with ID have low participation in PA activities and often fall below global recommendations, contributing to low PA levels.[7,8] In contrast, in African literature, specific data on adolescent girls with ID remain scarce, but general trends observed in adolescent girls without ID, including a high prevalence of sedentary behavior, an increase in overweight and an inadequacy of recommended physical activity, indicate the importance of studying these behaviors in vulnerable groups, such as adolescents with ID, especially in low-income countries like the DRC.[9]

In the DRC, some local studies conducted in Kinshasa in 2019 highlight that children and adolescents with intellectual disabilities (ID) exhibit generally low physical activity (PA), often linked to a lack of regular participation in adapted physical activity.[10,11] However, no recent studies have jointly assessed PA levels, sedentary behavior, and PA, particularly among adolescent girls with ID. These observations demonstrate an urgent need for in-depth research to systematically assess PA levels, sedentary behavior, and PA in adolescent girls with ID, given the lack of sports infrastructure in schools, insufficient motivation from parents and caregivers, and a shortage of qualified personnel for adapted physical activities in special schools in the DRC.

Thus, the following question arises: what is the level of activity, sedentary behavior and physical fitness of adolescent girls with ID compared to their peers without ID?

The present study aims to compare the level of PA, CS and CP of adolescent girls with and without ID in the Congolese context in order to reformulate the mandates on adapted strategies for promoting the practice of PA.

# Materials and methods

## *Nature and period of the study*

This was an analytical cross-sectional observational study conducted in a school setting over a 3-month period between the 1st November 2022 and 28th February 2023, in Kinshasa, Democratic Republic of Congo (DRC). It compared levels of physical activity, sedentary behavior, and certain components of physical fitness among female adolescents with intellectual disabilities (ID) and those of the same age group without ID.

The STROBE (Strengthening the Reporting of Observational studies in Epidemiology) recommendations applicable to cross-sectional studies were followed for the conduct of this study.

## *Study framework*

A total of five schools in Kinshasa, DRC, working to support female adolescents with intellectual disabilities, served as the setting for this study. These were the Bondeko Twendeleye, Mawete, Sembola, Kikesa Center, and Bon Départ School. The comparison group was recruited from two regular schools in Kinshasa/DR, respectively at the Chérubins school complex and the Frère Emmanuel Stablum school complex in Kinshasa/DRC. The choice of these schools was based on their recognized role in the supervision of female adolescents with intellectual disabilities in the city-province of Kinshasa and logistical considerations allowing for adequate recruitment.

## *Ethical considerations*

This study was conducted in accordance with the ethical principles set forth in the Declaration of Helsinki. The study protocol was reviewed and approved by the National Ethics Committee for Health of the DRC, which issued a favorable opinion under number 404/CNES/BN/PMMF/2022, dated October 30, 2022. Participants were informed of the research protocol. Parents or legal guardians provided written informed consent. Assent adapted to the adolescent girls' level of understanding was also obtained. All information was anonymized.

# Participants

## *Eligibility criteria*

Group with ID: female sex, aged 12 to 17 years, clinical diagnosis of moderate disability made by a psychologist or neuropsychiatrist, medical fitness to practice exercise, absence of musculoskeletal disorder limiting the performance of tests, written informed consent of the parent or legal guardian and assent of the adolescent.

Group without ID: female sex, aged between 12 and 17 years, absence of diagnosis of intellectual disability or neurodevelopmental disorder, medical fitness to practice physical activity, informed parental consent and assent of the adolescent.

Excluded from this study were adolescents under the age of 12 or over the age of 17, those with severe or profound intellectual disability, those with a medical contraindication to exercise, or in the absence of consent or assent.

## *Sampling and sample size*

In the present study, we used non-probability convenience sampling. A total of 247 female adolescents were selected, including 123 with moderate intellectual disability and 124 without. No a priori sample size calculation was performed, nevertheless, the resulting sample size provides statistical power greater than 80% to detect a moderate between-group effect (Cohen's $d \geq 0.50$) with a two-sided alpha risk set at 0.05, assuming balanced sample sizes. Due to the lack of non-random recruitment, the external validity of the results is limited to comparable institutional settings.

## *Questionnaire, measurements and tests used*

### Questionnaire

The Children and Adolescents Physical Activity and Sedentary Questionnaire (CAPAS-Q) was used to assess physical activity levels and sedentary behavior in adolescent girls with and without intellectual disability. In this school-based study, physical activity items 1 through 5 were used: Item 1. number of hours of physical activity (PA) at school, Item 2. presence of sweating during PA, Item 3. time spent walking or running each day, Item 4. sweating or shortness of breath while walking, and Item 5. number of flights of stairs climbed each day and 19 to 21 (sedentary behavior: item 1 time spent sitting/day in class, item 2 time in front of screens, phone, and how many times spent sitting for more than 1 hour 30 minutes without moving).[12] Cronbach's alpha coefficient was used to measure the consistency between selected items.

### Measures

Waist circumference: This was measured using a SECA 201 ± 1 mm measuring tape (SECA GmbH, Hamburg, Germany) with the adolescent girl standing with her feet shoulder-width apart and her arms at her sides.

The tape was placed horizontally at the level of the upper edge of the iliac crests, parallel to the floor, and the reading was taken after normal breathing without contracting the abdominal muscles. Two successive measurements were taken, and the final value was the average of the two measurements.

Body composition: Fat mass and lean mass were assessed using an OMRON BF511 bioelectrical impedance analysis (BIA) device (Omron Healthcare, Kyoto, Japan, accuracy ±1% for fat mass and ±0.1 kg for muscle mass). Adolescent girls stood barefoot on the device's electrodes, holding the handles with their arms at their sides, remaining still and relaxed. All metallic or electronic objects were removed before measurement. The girls were fasting or at least two hours after strenuous physical activity to standardize hydration. Each measurement was taken twice, and the final value was the average of the two measurements.

Tests

The physical fitness (PF) of the participants was assessed using tests from the EUROFIT battery, widely used for evaluating physical abilities in children and adolescents in school settings. The assessments took place Monday through Friday from 7:30 a.m. to 11:30 a.m. on the premises of the selected special or mainstream schools. Participants wore athletic clothing. The assessors were trained in the evaluation of the various tests.

Familiarization sessions with the tests and close supervision, in accordance with the recommendations for functional assessment in this population, were conducted.[13] A preliminary demonstration was performed to ensure participants' understanding and safety. Teachers from each class were involved in these assessments to facilitate their smooth execution.

Static equilibrium

Static balance was assessed using the Flamingo balance test, as described in the EUROFIT battery; the participant was asked to maintain a single-leg posture on a narrow bar for 60 seconds. Each participant was allowed 3 attempts and the best score was recorded.

Flexibility

Flexibility was assessed using the Sit and Reach test, as described in the EUROFIT battery, which involves asking the participant to lean forward in a seated position with their legs straight. Each participant was allowed two attempts, and the best score was recorded.

Bent arm suspension

Upper limb strength was measured using the flexed arm hang test, as defined in the EUROFIT battery, which consists of maintaining a hanging position under a bar, with the chin above the bar, for as long as possible. The score corresponded to the duration of the hold (s).

## Data collection technique

A data collection form containing sociodemographic information (father's and mother's ages and adolescent's age), body composition components (percentage of fat and muscle mass), and physical fitness components (balance, flexibility, arm strength) was developed. This form was supplemented by the Children and Adolescents Physical Activity and Sedentary Questionnaire (CAPAS-Q 8–18 years) to assess the level of physical activity and sedentary behavior in the school setting.

Bias

This study may have some biases, including the absence of: a pilot study validating the questionnaire in the local context, confounding factors, and multivariate analysis.

### *Statistical analysis*

The data collected for this study were coded and then saved using Excel 2013. Data quality control (double entry, outlier checks, and handling of missing data) was performed before export to Jamovi version 2.6.44 for appropriate statistical analyses. Quantitative variables are expressed as mean ± standard deviation in the tables, while qualitative variables are presented as frequencies and percentages.

The normality of the distribution was tested using the Shapiro-Wilk test, supplemented by graphical inspection (QQ-plots). Alpha values ranging from 0.80 to 0.89 indicated good internal consistency between questions. The independent Student's *t*-test was used when the assumptions of normality and homoscedasticity were met. In cases of unequal variances, Welch's correction was applied, while the non-parametric Mann-Whitney *U* test was used when the parametric conditions were not met. Associations between categorical variables were examined using tests to compare between quantitative variables, as well as Pearson's chi-squared test. When the expected frequencies were less than 5, Fisher's exact test was used.

Effect sizes were systematically reported to complement the interpretation of the statistical results. Cohen's *d* was applied to compare means and interpreted as negligible (<0.2), small (0.2–0.5), moderate (0.5–0.8), and large (>0.8). Cramér's *V* was applied to examine associations between categorical variables. Effect sizes were accompanied by their 95% confidence intervals.

Associations between anthropometric and physical fitness variables were analyzed using Pearson's correlation coefficient when the conditions of normality, linearity, and absence of influential outliers were met. Otherwise, Spearman's rank correlation coefficient was used.

Correlation strength was interpreted according to conventional thresholds: $r < 0.03$ – weak, $0.3 \leq r < 0.5$ – moderate, and $r \geq 0.5$ – strong. *P*-values <0.05 (two-tailed) were accepted as the threshold for statistical significance.

## Results

Table 1 reveals a similarity in age between female adolescents with and without intellectual disability (ID). The girls had significantly larger waist circumferences and body fat percentages compared to their peers without ID (67.0 ± 1.5 cm vs. 66.1 ± 1.5 cm, $p < 0.001$; 22.0 ± 1.8 vs. 21.3 ± 1.7 cm), with a moderate effect size ($d = 0.57$ and −0.77). Conversely, the percentage of muscle mass was significantly lower in girls with ID (19.9 ± 3.7%) than in their counterparts without ID (21.9 ± 3.9%; $p < 0.001$), with a moderate effect size ($d = 0.58$). Statistically significant differences were also observed for the physical fitness parameters. Flexibility performance scores were significantly lower in the adolescent group with intellectual disability (10.7 ± 1.8 cm vs. 15.0 ± 1.9 cm; $p < 0.001$), with a very large effect size ($d = -2.23$). Similarly, a significant reduction in static balance was observed in the adolescent group with intellectual disability (6.5 ± 3.1 s vs. 10 ± 4 ± 1.5 s; $p < 0.001$), with a large effect size ($d = -1.59$). Upper limb strength showed a significant difference between the groups ($p = 0.022$), but the magnitude of this difference remained small ($d = 0.29$) (Table 1).

The results presented in the table above reveal that girls with intellectual disability (ID) (87.8%) spend less than 2 hours of physical activity (PA) at school, compared to none in the group without ID. Conversely, 91.9% of girls without ID engage in 2–4 hours of PA at school, compared to only 10.6% of girls with ID, a very

**Table 1.** Comparison of sociodemographic parameters, body composition and physical fitness

| Parameters | Group[a] | N | Mean ± SD | IC 95% | *P* | Size of the effect (*d* of Cohen) |
|---|---|---|---|---|---|---|
| Age (year) | FA with ID | 123 | 13.0 ± 0.8 | [12.86, 13.14] | 0.061 | −0.2392 |
| | FA without ID | 124 | 13.2 ± 0.9 | [13.04, 13.36] | | |
| Waist measurement (cm) | FA with ID | 123 | 67.0 ± 1.5 | [66.73, 67.27] | <0.001 | 0.57 |
| | FA without ID | 124 | 66.1 ± 1.5 | [65.83, 66.37] | | |
| Total fat (%) | FA with ID | 123 | 22.0 ± 1.8 | [21.68, 22.32] | 0.045 | −0.07 |
| | FA without ID | 124 | 21.3 ± 1.7 | [21.60, 22.20] | | |
| Muscle (%) | FA with ID | 123 | 19.7 ± 3.7 | [19.05, 20.36] | <0.001 | −0.58 |
| | FA without ID | 124 | 21.9 ± 3.9 | [21.21, 22.59] | | |
| Flexibility (cm) | FA with ID | 123 | 10.7 ± 1.8 | [5.95, 10.51] | <0.001 | −2.23 |
| | FA without ID | 124 | 15.0 ± 1.9 | [14.66, 15.05] | | |
| Balance (dry) | FA with ID | 123 | 6.5 ± 3.1 | [5.14, 6.67] | <0.001 | −1.58 |
| | FA without ID | 124 | 10.4 ± 1.5 | [10.14, 10.67] | | |
| Arm strength (dry) | FA with ID | 123 | 2.3 ± 0.8 | [2.16, 2.44] | 0.022 | 0.29 |
| | FA without ID | 124 | 2.5 ± 1.0 | [2.32, 2.68] | | |

[a] – ID: intellectual disability; FA: female adolescents.

**Table 2.** Comparison of physical activity levels of female adolescents with and without intellectual disabilities

| Variables/ categories | FA[a] with ID (n = 123) N(%) | FA without ID (n = 124) N(%) | *p* (Chi²) | Effect size (Cramér's *V*) |
|---|---|---|---|---|
| Number of PA hours at school (Q1) | | | <0.001 | 0.886 |
| Less than 2 hours | 108 (87.8%) | 0 (0%) | | |
| 2 to 4 hours | 13 (10.6%) | 114 (91.9%) | | |
| 4 am to 6 am | 2 (1.6%) | 10 (8.0%) | | |
| More than 6 hours | 0 (0.0%) | 0 (0%) | | |
| Presence of sweat during the PA(Q2) | | | <0.001 | 0.937 |
| No way | 117 (95.1%) | 2 (1.6%) | | |
| A little | 4 (3.3%) | 49 (39.5%) | | |
| Moderately | 1 (0.8%) | 51 (41.1%) | | |
| A lot | 1 (0.8%) | 22 (17.7%) | | |
| Time spent walking or run every day (Q3) | | | <0.001 | 0.569 |
| Less than 15 minutes | 115 (93.5%) | 50 (40.3%) | | |
| 15 to 30 minutes | 7 (5.7%) | 47 (37.9%) | | |
| 30 minutes to 1 hour | 1 (0.8) | 20 (16.1%) | | |
| More than 1 hour | 0 (0.0%) | 7 (5.6%) | | |
| Sweating or shortness of breath during walking (Q4) | | | <0.001 | 0.635 |
| No way | 116 (94.3%) | 42 (33.8%) | | |
| A little | 7 (5.7%) | 52 (41.9%) | | |
| Moderately | 0 (0%) | 19 (15.3%) | | |
| A lot | 0 (0%) | 11 (8.8%) | | |
| Number of floors climbed foot every day (Q5) | | | <0.001 | 0.731 |
| Less than 2 | 119 (96.7%) | 32 (25.8%) | | |
| 3 to 5 | 4 (3.3%) | 42 (33.8%) | | |
| 6 to 10 | 0 (0%) | 20 (16.1%) | | |
| More than 10 | 0 (0%) | 30 (24.1%) | | |

[a] – FA: female adolescents.

significant difference (Cramér's $V = 0.886$). Regarding the perceived level of effort during PA, measured by perspiration, 95.1% of girls with ID reported "not at all," compared to only 1.6% of those without ID. In contrast, girls without ID more frequently reported engaging in physical activity ranging from "a little" to "a lot" in intensity (Cramér's $V = 0.937$). Overall, 93.5% of girls with intellectual disabilities (ID) spent significantly less time walking or running each day, being active for less than 15 minutes compared to 40.3% of girls without ID. No girl with ID exceeded one hour of walking/running activity per day, while 5.6% of those without ID did. The vast majority of girls with ID (94.3%) reported neither sweating nor shortness of breath, compared to only 33.8% of girls without ID. 96.7% of girls with ID climbed fewer than two flights of stairs daily, while girls without ID climbed more flights (up to more than 10) (Table 2).

Table 3 shows that girls with intellectual disabilities (ID) exhibited significantly more sedentary behavior than those without ID. In the classroom, 78.9% of girls with ID sat for 6 to 8 hours per day, while the majority of girls without ID spent less than 4 hours sitting

**Table 3.** Comparison of sedentary behavior levels among female adolescents with and without intellectual disabilities

| Variables/ categories | FA[a] with ID (n = 123) | FA without ID (n = 124) | *p* (Chi²) | Effect size (Cramér's *V*) |
|---|---|---|---|---|
| | N(%) | N(%) | | |
| Time spent sitting/ day in class | | | <0.001 | 0.783 |
| Less than 2 hours | 0 (0.0%) | 36 (29.0%) | | |
| 2 to 4 hours | 0 (0.0%) | 32 (25.8%) | | |
| 4 am to 6 am | 26 (21.1%) | 21 (16.9%) | | |
| 6 am to 8 am | 97 (78.9%) | 14 (11.3%) | | |
| 8 am to 10 am | 0 (0.0%) | 12 (9.7%) | | |
| More than 10 hours | 0 (0.0%) | 9 (7.3%) | | |
| Time spent in front of the screen | | | <0.001 | 0.834 |
| Less than 30 minutes | 0 (0.0%) | 54 (43.5%) | | |
| 30 minutes to 1 hour | 0 (0.0%) | 29 (23.4%) | | |
| 1 to 1.5 hours | 4 (3.3%) | 8 (6.5%) | | |
| 1.5 to 2 hours | 89 (72.4%) | 6 (4.8%) | | |
| 2 to 2.5 hours | 23 (18.7%) | 7 (5.6%) | | |
| More than 2 hours and 30 minutes | 7 (5.7%) | 20 (16.1%) | | |
| Number of times passed in position seated/ for more than 1 hour 30 minutes without moving | | | <0.001 | 0.647 |
| 0 times | 0 (0.0%) | 20 (16.1%) | | |
| 1 time | 0 (0.0%) | 24 (19.4%) | | |
| Twice | 1 (0.8%) | 30 (24.2%) | | |
| 3 times | 46(37.4) | 18 (14.5%) | | |
| 4 times | 44 (35.8%) | 13 (10.5%) | | |
| More than 4 times | 32 (26.0%) | 19 (15.3%) | | |

[a] – FA: female adolescents.

($p < 0.001$, Cramér's $V = 0.783$). Regarding screen time, 72.4% of girls with ID were exposed for 1.5 to 2 hours per day, compared to 66.9% of girls without ID for less than 1 hour ($p < 0.001$, Cramér's $V = 0.834$). In addition, prolonged sitting (>1h 30 min) without interruption was more frequent in girls with ID, with 37.4% reporting 3 episodes and 35.8% 4 episodes per day, compared to 14.5% and 10.5% in those without ID ($p < 0.001$, Cramér's $V = 0.647$) (Table 3).

**Table 4.** Comparison of the mean ages of mothers and fathers of female adolescents with intellectual disabilities

| Participants | Group | N | Mean ± SD | *P* |
|---|---|---|---|---|
| Mother of | Adolescents with ID | 124 | 34.2 ± 5.8 | <0.001 |
| | Adolescents without ID | 123 | 24.7 ± 2.5 | |
| Father of | Adolescents with ID | 124 | 47.4 ± 7.0 | <0.001 |
| | Adolescents without ID | 123 | 38.6 ± 5.4 | |

**Table 5.** Association between anthropometric and physical fitness variables

| | | Age | Waist circumference | Total fat | BMI | Muscle | Flexibility | Balance | Arm strength |
|---|---|---|---|---|---|---|---|---|---|
| Age (year) | Pearson's *r* | – | | | | | | | |
| | *p*-value | – | | | | | | | |
| Waist measurement (cm) | Pearson's *r* | 0.42*** | – | | | | | | |
| | *p*-value | <0.001 | – | | | | | | |
| Total fat (%) | Pearson's *r* | 0.57*** | 0.45*** | – | | | | | |
| | *p*-value | <0.001 | <0.001 | – | | | | | |
| BMI | Pearson's *r* | 0.29*** | 0.21*** | 0.27*** | – | | | | |
| | *p*-value | <0.001 | <0.001 | <0.001 | – | | | | |
| Muscle (%) | Pearson's *r* | 0.74*** | 0.52*** | 0.66*** | 0.32*** | – | | | |
| | *p*-value | <0.001 | <0.001 | <0.001 | <0.001 | – | | | |
| Flexibility (cm) | Pearson's *r* | 0.52*** | 0.14* | 0.43*** | 0.18* | 0.71*** | – | | |
| | *p*-value | <0.001 | 0.01 | <0.001 | 0.011 | <0.001 | – | | |
| Balance (dry) | Pearson's *r* | 0.56*** | 0.13* | 0.42*** | 0.14* | 0.69*** | 0.77*** | – | |
| | *p*-value | <0.001 | 0.02 | <0.001 | 0.01 | <0.001 | <0.001 | – | |
| Arm strength (dry) | Pearson's *r* | 0.08 | 0.12* | 0.09 | 0.05 | 0.07 | −0.07 | 0.05 | – |
| | *p*-value | 0.120 | 0.030 | 0.077 | 0.212 | 0.127 | 1,000 | 0.218 | – |

Note: $H_a$ is a positive correlation.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$, one-sided

The analyses of the results in Table 4 show an association between parental age and the presence of an intellectual disability (ID). Parental age differed significantly between the groups. The mothers of female adolescents with ID were older than those without ID (34.2 ± 5.8 years vs. 24.7 ± 2.5 years, $p$ <0.001). Similarly, the fathers of female adolescents with ID were older than those in the group without ID (47.4 ± 7.0 years vs. 38.6 ± 5.4 years, $p < 0.001$) (Table 4).

Table 5 reveals statistically significant associations between age and all anthropometric and motor variables, particularly percentage of muscle mass ($r = 0.74$; $p < 0.001$). Percentage of muscle mass was highly associated with flexibility ($r = 71$) and balance ($r = 0.69$), indicating a central role for muscle development in motor performance during adolescence. Flexibility and balance also showed a strong association ($r = 0.77$), which could reflect shared neuromuscular mechanisms. In contrast, arm strength showed no significant association with the other variables (Table 5).

## Discussion

The present study reveals significant disparities in physical activity level (PAL), behavior sedentary (BS) and physical fitness (PF) among female adolescents with and without intellectual disability (ID). Female adolescents with ID, compared with those without ID demonstrate greater adiposity, reduced muscle mass, and lower performance in tests assessing balance, flexibility and upper-limb strength. Taken together with lower physical activity (PA) levels and increased sedentary time, these findings delineate a consistently unfavorable physiological and behavioral profile. The large effect sizes observed for balance and flexibility indicate that these dimensions represent particularly sensitive markers of functional limitations within this population.

Beyond description, these observations are part of a robust convergence with literature and international studies. Recent studies conducted by Puszczałowska-Lizis et al.[14,15] show that young people with ID or

a Down syndrome display systematically exhibit deficits in motor performance and CP compared to their peers without ID. Research studies conducted in North America and Europe respectively by Dairo et al.[16] and Hilgenkamp et al.[17] confirm also lower levels of PA and a higher BS in adolescents with ID. Consistent findings across Europe, North America, and Africa suggest that these disparities are driven by shared cultural, educational, systemic, and developmental factors instead of purely local determinants.

However, the interpretation of these gaps needs a consideration of the socio-economic context. The availability of inclusive infrastructure, along with adapted and supportive policies in low-income countries, contributes to partially mitigating these differences.[18] On the other hand, in resource-constrained environments, such as the Democratic Republic of the Congo, structural constraints – including limited access to sports facilities, poor school integration, and a lack of specialized programs – can amplify observed inequalities. This contextual reading notes that, while the phenomenon is global, its intensity is modulated by systemic factors.

The mechanisms underlying the observed discrepancies appear multidimensional. From a behavioral perspective, social barriers, limited access to opportunities, a lack of physical adaptations, and gender-related issues are likely to significantly reduce the engagement of adolescent girls with intellectual disabilities.[19] Psychosocial determinants, such as weak intrinsic motivation, reduced self-efficacy, and limited social support, have also been identified as key factors for participation in AP.[20] At a biological level, certain conditions associated with intellectual disabilities (ID) – such as metabolic alterations, muscular hypotonia, and endocrine disorders - can promote the accumulation of fat mass and limit the development of muscle mass.[21]

The observed association between low AP levels and unfavorable body composition is in accordance with current models; however, this must be interpreted with great caution. Salas et al.[22] suggest that a low level of physical engagement is associated with increased adiposity and decreased muscle mass, but the cross-sectional nature of the data does not allow for a causal inference. A bidirectional link is likely, in which physical limitations decrease participation in activity, which in turn worsens the body composition profile.

The deficits observed during balance and flexibility tests can be interpreted in light of the biomechanical and neuromotor models . The work of Hartman et al.[23] suggests that alterations in neuromuscular coordination and postural control are common in young people with intellectual disabilities, affecting directly stability and efficiency of motor skills. The decrease in muscle mass observed in our study could represent a factor aggravating these limitations, as indicated by Oppewal and Hilgenkamp.[24] Parallel to this, the lack of a significant association between upper limb strength and body variables may reflect the specific nature of muscular adaptations, as well as the influence of motivational and motor learning factors on test performance.[25]

The finding of advanced parental age among female adolescents with intellectual disabilities corroborates data indicating an association between advanced parental age and a high risk of neurodevelopmental disorders.[26] However, this relationship must be interpreted with caution due to the lack of control for key confounding factors, including socio-economic, nutritional, and obstetric variables.

The finding of advanced parental age among female adolescents with intellectual disabilities corroborates data indicating an association between advanced parental age and a high risk of neurodevelopmental disorders.[26] However, this relationship must be interpreted with caution due to the lack of control for key confounding factors, including socio-economic, nutritional, and obstetric variables.[27,28]

From an applied perspective, these findings emphasize the need for multidimensional intervention strategies aimed at promoting physical activity among female adolescents with ID. Such interventions should incorporate not only programs adapted from a motor perspective, but also psychological and environmental factors, particularly in the context of low-income countries. An integrated approach that accounts for both individual and structural factors appears essential for sustainably reducing the observed inequalities.

## Strengths and limitations of the study

### *Strengths*

The strengths of this study are based on three fundamental elements: its relatively large sample size and the presence of an equivalent comparative group, the use of standardized and validated tests for physical fitness (EUROFIT), and the detailed assessment of physical activity and sedentary behaviors.

### *Limitations*

The limitations of this are based on five points, namely:

- convenience sample, limiting generalizability;
- use of a self-reported questionnaire (CAPAS-Q) not validated locally;

- cross-sectional design: associations observed, but no causal inference possible;
- no multivariate adjustment for confounding factors (socioeconomic status, pubertal stage);
- there is a possibility of social desirability bias and motivational variability in physical tests, especially among adolescent girls with intellectual disabilities.

## Perspectives

Future research should:

- longitudinally evaluate the trajectories of physical activity and physical fitness in young people with intellectual disabilities;
- develop and validate locally appropriate assessment tools;
- study the impact of targeted interventions on physical activity, physical fitness, and body composition;
- explore the interactions between biological, environmental and social factors on physical and motor development in adolescent girls with ID.

## Implications in practice and public health

The results suggest that adolescent girls with intellectual disabilities could benefit from tailored programs aimed at:

- increasing the time and intensity of adapted physical activity in schools within our community;
- increasing specific motor skills such as balance, flexibility, and muscle strength);
- monitoring changes in body composition and preventing excess body fat.

The implementation of these interventions must take into account the motor and cognitive limitations of this population and incorporate motivating and safe strategies.

## Conclusion

This study reveals that adolescent girls with moderate intellectual disability present a profile characterized by:

- higher body fat and reduced muscle mass;
- inferior physical condition (balance, flexibility, and lower limb strength);
- unfavorable levels of physical activity and sedentary behavior.

These differences between adolescent girls with and without intellectual disabilities are statistically significant and have potential implications for their health and social participation. These findings reinforce the need to develop an adapted physical activity program to promote physical activity and motor development in this population group.

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